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I Claim

1. An energy conversion system that is immersed in a working substance having a plurality of molecules, said system comprising:

a base member; and

a plurality of nanometer scale assemblies that convert energy from one form to another coupled to said base member, each of said nanometer scale assemblies comprising:

a molecular impact mass that reduces the velocity of said molecules that impact said impact mass, said impact mass being restrained to move within a predetermined range of distance.

2. The energy conversion system of claim 1, wherein said impact mass further comprises a generator device that converts kinetic energy of said impact mass, resulting from said molecules impacting said impact mass, into a different form of energy.

3. The energy conversion system of claim 2, wherein said impact mass is electrostatically charged.

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4. The energy conversion system of claim 1, wherein said nanometer scale assembly further comprises:

a generator device that converts kinetic energy of said impact mass, resulting from said molecules impacting said impact mass, into a different form of energy.

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5. The energy conversion system of claim ¹⁸4, wherein said generator device is an electromagnetic

generator that converts mechanical energy into electromagnetic energy.

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~~6~~. The energy conversion system of claim 3, wherein said impact mass comprises a gas molecule.

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~~7~~. The energy conversion system of claim ⁴~~6~~, wherein said gas molecules are restrained by being located in an enclosed carbon nanotube.

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~~8~~. The energy conversion system of claim ⁵~~7~~, wherein a first half of said plurality of assemblies comprises nanotubes containing at least one positively charged gas molecules and a second half of said plurality of assemblies comprises nanotubes containing at least one negatively charged gas molecule.

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~~9~~. The energy conversion system of claim ¹⁸~~8~~, wherein said impact mass comprises a carbon nanotube.

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~~10~~. The energy conversion system of claim ²⁰~~9~~, wherein said base member comprises a conductive lower plate.

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~~11~~. The energy conversion system of claim 1, wherein said nanometer scale assembly further comprises:

a restraining member that limits motion of said impact mass within a predetermined range of distance.

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~~12~~. The energy conversion system of claim 1, wherein said molecular impact mass contributes, at

least in part, to restraining movement of said impact mass within a predetermined range of distance.

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~~13~~. The energy conversion system of claim 1, wherein said working substance is a working fluid.

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⁴⁷ ~~14~~. The energy conversion system of claim ~~13~~, wherein said working fluid comprises a first substance laden with particulates of a second substance.

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⁴⁸ ~~15~~. The energy conversion system of claim ~~14~~, wherein said second substance comprises a carbon-based molecule.

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⁴⁷ ~~16~~. The energy conversion system of claim ~~13~~, wherein said working fluid is a liquid.

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⁴⁷ ~~17~~. The energy conversion system of claim ~~13~~, wherein said working fluid is a gas.

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⁵¹ ~~18~~. The energy conversion system of claim ~~17~~, wherein said gas is air at atmospheric pressure.

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⁵¹ ~~19~~. The energy conversion system of claim ~~17~~, wherein said working substance is a heavy molecule gas.

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⁵³ ~~20~~. The energy conversion system of claim ~~19~~, wherein said heavy molecule gas is xenon gas.

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21. The energy conversion system
of claim 13, ⁴⁷ wherein said working fluid is at
an elevated pressure.

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44 22. The energy conversion system of
claim 11, wherein said restraining member is coupled
between said impact mass and said base member.

23. The energy conversion system of claim 4, ¹⁵
wherein said generator device is coupled between said
impact mass and said base member.

24. The energy conversion system of
claim 23, wherein said generator device is a
piezoelectric generator having a pair of output leads.

25. The energy conversion system of
claim 24, wherein motion of said impact mass is limited
to being substantially between a neutral point and a
single limit point.

26. The energy conversion system of
claim 25, wherein said piezoelectric generator produces
a pulsating DC output.

27. The energy conversion system of
claim 26, wherein said each pair of said output leads
are coupled together in series to provide a system
output.

28. The energy conversion system of
claim 26, wherein said each pair of said output leads
are coupled together in parallel to provide a system
output.

29. The energy conversion system of claim 24, wherein said generator device further comprises:

a resistor coupled between said pair of output leads.

30. The energy conversion system of claim 29, wherein said generator device further comprises:

a thermoelectric generator comprising a hot side thermally coupled to said resistor and a cold side; and

a thermally conductive member coupled to said cold side.

31. The energy conversion system of claim 30, wherein said generator device further comprises:

a first layer of thermal insulation between said resistor and said working substance; and

a second layer of thermal insulation between said thermoelectric generator and said working substance.

32. The energy conversion system of claim 30, wherein said thermoelectric generator further comprises:

a pair of output leads.

33. The energy conversion system of claim 32, wherein said each pair of said output leads are coupled together in series to provide a system output.

34. The energy conversion system of claim 33, further comprising:

a load resistor thermally isolated from said working substance, said system output being coupled to said load resistor.

35. The energy conversion system of claim 34 further comprising:

a thermally conductive housing that contains said base member, said plurality of nanometer scale assemblies and said working substance.

36. The energy conversion system of claim 35, wherein said energy conversion system operates as a heat pump that cools an external substance.

37. The energy conversion system of claim 35, wherein said energy conversion system operates as a heat pump that heats an external substance.

38. The energy conversion system of claim 35 further comprising:

a heat engine coupled between said housing and said load resistor.

39. The energy conversion system of claim 32, wherein said each pair of said output leads are coupled together in parallel to provide a system output.

40. The energy conversion system of claim 29 further comprising:

a heat engine having a hot side coupled to said resistor and a cold side coupled to a heat sink.

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~~41~~. The energy conversion system of claim 1, wherein said molecular impact mass comprises a nanometer scale paddle.

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⁵⁶~~41~~. The energy conversion system of claim ~~41~~, wherein said nanometer scale paddle is a silicon paddle.

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⁵⁶~~41~~. The energy conversion system of claim ~~41~~, wherein said nanometer scale paddle is a carbon paddle.

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⁵⁶~~41~~. The energy conversion system of claim ~~41~~, wherein said impact mass further comprises:
a plurality of carbon nanotubes, each of which is mounted at one end to said paddle.

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~~48~~. The energy conversion system of claim 1 further comprising:

a three-dimensional object having an exterior surface, said plurality of nanometer scale assemblies being mounted to said exterior surface, said object being immersed in said working substance.

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~~48~~. The energy conversion system of claim ⁶⁰~~45~~ further comprising:

a drive system that varies operation of said plurality of nanometer scale assemblies such that assemblies on one portion of said object create a pressure differential in comparison to operation of said plurality of assemblies on a different portion of

said object, said pressure differential creating a net force on said object.

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47. The energy conversion system of claim ⁶¹46, wherein said pressure differential operates to propel said object through said working substance.

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48. The energy conversion system of claim ⁶¹46, wherein said drive system comprises:
a plurality of electromagnets.

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49. The energy conversion system of claim ²¹10 further comprising:

an upper conductive plate; and
a source of potential that, when applied, generates an electric field that creates a force that is applied to said impact masses causing said impact masses to remain generally perpendicular to the surface of said lower conductive plate.

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50. The energy conversion system of claim 1, wherein said impact mass has a first end fixed to said base member that operates, at least in part, to restrain movement of said impact mass within a predetermined distance, and a second end that is free to move, collisions between said second ends of different impact masses creating friction that converts kinetic energy of said impact masses into thermal energy.

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⁶⁴ 51. The energy conversion system of claim ⁵⁰50, wherein said impact mass comprises a carbon nanotube and said base member comprises a thermally conductive material.

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~~52~~. The energy conversion system of claim ⁶⁵~~51~~
further comprising:

a heat engine having a hot side coupled to
said base member and a cold side coupled to a heat
sink.

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~~53~~. The energy conversion system of claim ¹⁸~~4~~,
wherein said generator device comprises an
electromotive force generator that converts kinetic
energy into electrical energy.

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~~54~~. The energy conversion system of claim 2,
wherein said generator device comprises an
electromotive force generator that converts kinetic
energy into electrical energy.

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⁷ ~~55~~. The energy conversion system of
claim ~~54~~, wherein said electromotive force generator
comprises:

a plurality of nanometer members each of
which is loosely mounted between an individual pair of
said first and second mounting points that are fixed to
said base member such that slack exists in each of said
nanometer members; and

an external magnetic field that, when applied
to said nanometer members, if said nanometer members
are moving, induces a voltage between said first and
second mounting points.

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⁸ ~~56~~. The energy conversion system of
claim ~~55~~, wherein said nanometer member is electrically
resistive.

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9 ⁵⁷. The energy conversion system of claim ~~56~~, wherein said base member is thermally conductive, said system further comprising:

a first electrically and thermally conductive rail, said first plurality of mounting points being connected to said first rail, said first rail being connected to said base member; and

a second electrically and thermally conductive rail, said second plurality of mounting points being connected to said second rail, said second rail being connected to said base member.

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10 ⁵⁸. The energy conversion system of claim ~~57~~, wherein Brownian motion of said nanometer members through said external magnetic field generates a voltage across each individual pair of first and second mounting points.

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11 ⁵⁹. The energy conversion system of claim ~~58~~, wherein said voltage generates an electrical current that flows from a first nanometer member to said first rail, through a second nanometer member, through said second rail, and to said first nanometer member.

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12 ⁶⁰. The energy conversion system of claim ~~59~~, wherein said current causes said nanometer members and said first and second rails to heat up, said thermal energy being transferred from said first and second rails to said base member.

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⁶¹. The energy conversion system of claim ~~60~~ further comprising:

a layer of thermal insulation mounted to a surface of said base member between said base member and said nanometer members, said insulation substantially covering said surface of said base member.

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8 ~~62~~. The energy conversion system of claim ~~58~~, wherein said nanometer member comprises a carbon nanotube.

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~~63~~. The energy conversion system of claim 2, wherein said impact mass comprises:

a nanometer member loosely mounted between a pair of said first and second mounting points that are fixed to said base member such that slack exists in said nanometer member; and

an external magnetic field that, when applied to said nanometer member, if said nanometer member is moving, induces a voltage between said first and second mounting points.

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8 ~~64~~. The energy conversion system of claim ~~58~~, wherein said base member is thermally conductive, said system further comprising:

a resistor electrically coupled between said first and second points and thermally coupled to said base; and

a plurality of thermoelectric generators comprising first and second thermally responsive members and a pair of generator output leads, each of said first thermally responsive members being coupled to said base member, each of said output leads being coupled together in series.

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~~65~~. The energy conversion system of claim 1, wherein said impact mass comprises a compressible portion of a piezoelectric generator.

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~~66~~. The energy conversion system of claim ¹⁸~~4~~, wherein said generator device is a piezoelectric generator.

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~~42~~⁶⁷. The energy conversion system of claim ~~66~~, wherein said impact mass comprises a compressible portion of said piezoelectric generator.

68. The energy conversion system of claim 1, wherein said impact mass converts energy from one form to another and operates to restrain itself from moving beyond a predetermined range of distance.

69. The energy conversion system of claim 68, wherein said impact mass comprises a carbon nanotube.

70. An energy conversion system that is immersed in a working substance having a plurality of molecules, and that converts energy from one form to another, said system comprising:

- a first thermally conductive member;
- a second thermally conductive member;
- a first plurality of mounting points;
- a second plurality of mounting points, each of said second plurality of mounting points corresponding to one of said first plurality of mounting points;

- a plurality of nanometer members each of which is loosely mounted between one of said first and

at least a first heat engine comprising a HOT side and a COLD side, said HOT side being thermally coupled to one of said resistor assemblies and said COLD side being thermally coupled to a first heat sink.

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~~72~~. An energy conversion system that is immersed in a working substance having a plurality of molecules, said system comprising:

a thermally conductive base member;

a plurality of nanometer scale assemblies that convert energy from one form to another coupled to said base member, each of said nanometer scale assemblies comprising:

a molecular impact mass that reduces the velocity of said molecules that impact said impact mass, said impact mass being restrained to move within a predetermined range of distance and comprising a nanometer member loosely mounted between a pair of said first and second mounting points that are fixed to said base member such that slack exists in said nanometer member, said impact mass further comprising a generator device that converts kinetic energy of said impact mass, resulting from said molecules impacting said impact mass, into a different form of energy; and

a resistor coupled between said first and second mounting points and thermally coupled to said base member;

at least a first layer of thermal insulation between said working substance and said thermally coupled resistor and base member;

at least one heat engine comprising:

a HOT side thermally coupled to said base member; and

a COLD side thermally coupled to a heat sink; and

an external magnetic field that, when applied to each of said nanometer members, if said nanometer member is moving, induces an electric field that induces current to flow.

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73. A method of using an energy conversion system immersed in a working substance having a plurality of molecules to convert energy from one form to another, said system comprising a base member and a plurality of ^{nanometer} assemblies each of which comprises an impact mass that is restrained to move within a predetermined range of distance, said method comprising:

generating kinetic energy from statistical variations in molecular impacts of said molecules on said impact mass;

converting said kinetic energy to another form of energy.

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74. The method of claim ⁷¹73, wherein said another form of energy is pulsating DC electrical energy.

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75. The method of claim ⁷¹73, wherein said another form of energy is radiated electromagnetic energy.

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76. The method of claim ⁷¹73, wherein said another form of energy is AC electrical energy.

77. The method of claim 76 further comprising:

reconverting said AC electrical energy into thermal energy.

78. The method of claim 77 further comprising:

converting said thermal energy into DC electrical energy.

79. The method of claim 78, wherein said converting said thermal energy comprises:

applying a plurality of thermoelectric generators to said system, each of said thermoelectric generators having a pair of output leads that are coupled together in series; and

outputting a system output from said plurality of series-connected output leads.

80. The method of claim 79 further comprising:

providing a resistive load across said system output, said resistive load being thermally isolated from said working substance.

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~~81~~. The method of claim ⁷²~~74~~, wherein converting comprises:

providing an individual output from each of said plurality of assemblies; and

coupling said plurality of individual outputs together in series to create a system output.

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~~82~~. The method of claim ⁷³~~81~~ further comprising:

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providing a resistive load across said system output, said resistive load being thermally isolated from said working substance.

second pluralities of mounting points such that slack exists in each of said nanometer members, wherein Brownian motion causes said nanometer members to move;

a plurality of resistive elements, each of which is thermally coupled to said first conductive member and is mounted between one of said first and second pluralities of mounting points such that there is a resistive element corresponding to each nanometer member;

an external magnetic field that, when applied to said moving nanometer members, induces an electric field that induces current to flow; and

a plurality of thermoelectric generators comprising first and second thermally responsive members, each of said first thermally responsive members being coupled to said first thermally conductive member, each of said second thermally responsive members being coupled to said second thermally conductive member.

71. An energy conversion system that is immersed in a working substance having a plurality of molecules, said system comprising:

a base member;

a plurality of nanometer scale assemblies coupled to said base member, each of said nanometer scale assemblies comprising:

a molecular paddle having a first end fixed to said base member and a second end that is free to move;

a piezoelectric generator comprising a portion of piezoelectric material and a resistor assembly coupled to said first end; and